

## Review 10 optimization (max/min)

candidates

1. endpoints
2.  $f' = \infty$
3.  $f' = 0$

absolute (extreme) only one  
plug in candidates to  $f(x)$ relative (extreme) could be several  
1<sup>st</sup> der test sign graphs with a  
sentence2<sup>nd</sup> der test  $f''$  ⚠ "at" vs "is"  
max at  $x = \_$  max is  $y = \_$ 

don't say "if"

Ex 1 Find the maximum value of

$$f(x) = \frac{x^3}{3} - 4x \text{ on } [-1, 4]$$

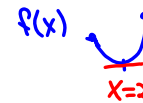
candidates

$$x = -1 \quad f(-1) = 3^2/3 \quad f'(x) = x^2 - 4 = 0$$

$$x = 4 \quad f(4) = 16/3 \quad \text{max is } 16/3$$

$$x = 2 \quad f(2) = -16/3$$

$$x = -2$$



Mar 6-8:58 AM

Mar 6-9:48 AM

Ex 2

$x$	3	4	6	7
$f(x)$	-4	1	5	8

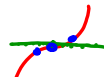
 $f(x)$  is continuous, differentiable & monotonic  
on  $[3, 8]$ . which must be true?

T I  $f(8) > 8$

F II  $f'(5) > 0$

F III  $f'(c) = 3$  for exactly one value of  $c$  in  $[3, 7]$

MUT  $f'(c) = \frac{8-4}{7-3} = 3$

Ex 3 A storm washes sand away from a beach  
causing the water to get closer to a road at  
a rate of  $f(t) = \sqrt{t} + \cos t - 3$  ft/hr. The  
storm lasts 5 hours. when the distance between  
the water and the road decreasing most rapidly?

$$t = 0 \quad f(0) = -2 \quad f' = \frac{1}{2\sqrt{t}} - \sin t = 0$$

$$t = 5 \quad f(5) = -1.4803$$

$$t = 0.6619 \quad f(0.6619) = -1.3976$$

$$t = 2.8401 \quad f(2.8401) = -2.7697$$

Mar 6-10:00 AM

Mar 6-10:10 AM